

MAXiMAT¹⁰

PRECISION LATHE • VERTICAL MILLING MACHINE • DRILL PRESS



THE NEW

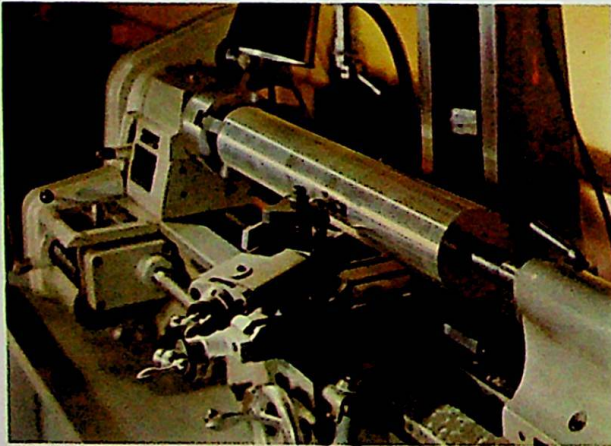
MAXiMAT¹⁰

DESIGNED FOR MAXIMUM VERSATILITY, EFFICIENCY AND ECONOMY

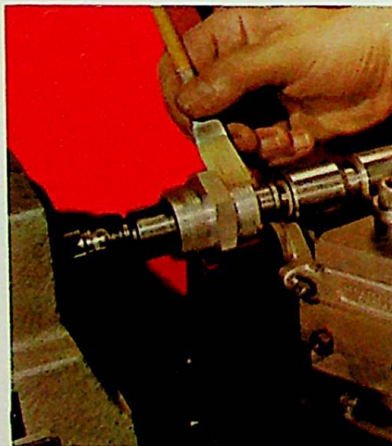
In 1800, Henry Maudslay demonstrated lathe design improvements that added up to one of the most important inventions in history. He had built the first metal-cutting lathe capable of producing a variety of duplicate screws. Truly the father of all machines which followed, the screw cutting lathe

is the most useful and versatile of all metal cutting tools. But from the start, lathes were designed to turn and thread only; milling machines to cut laterally; drilling machines to bore holes. Rarely did machine builders attempt to expand upon these basic machine functions. Yet the beds, feed

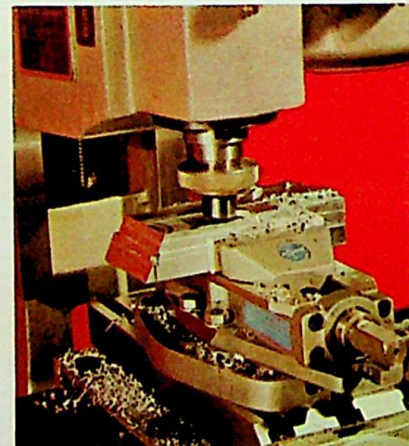
screws, spindles and bearings of lathes, drilling, and milling machines have many similarities in common. By combining these functions into one compact unit, there would be a cost saving; one machine frame instead of two—tool holders as well as work-holding devices would not have to be duplicated.



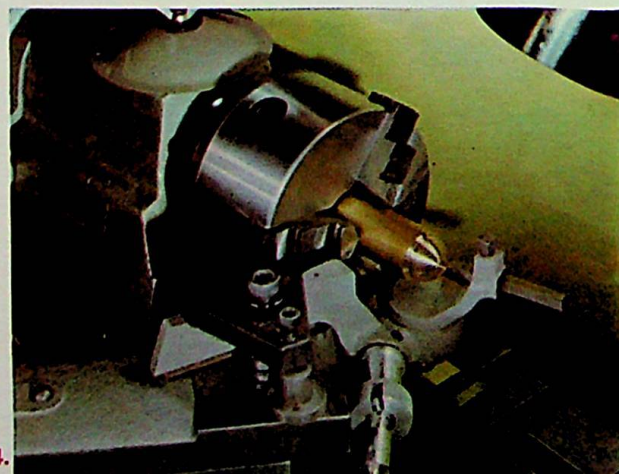
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This Partial List of Maximat Users Is Representative Of Hundreds Of U. S. Installations. I.B.M. Corp. / G. E. Marshall Space Flight Center / Owens-Illinois Glass Co. / M.I.T. / Picatinny Arsenal / Lawrence Radiation Lab., U. of C. / The Boeing Co. / Cleveland Cap Screw Co. / Massachusetts General Hospital / General Motors / Sandia Corp. / U. S. Naval Ordnance Test Station / General Dynamics / Monsanto Research / Pan-American World Airways / U. S. Army Missile Support Command, Redstone Arsenal / General Electric Co. / Union Carbide Corp. / McDonnell Aircraft Corp. / Texas Instruments.

This idea developed into an extensive program of invention and research that resulted in the world-famous UNIMAT. (More than 80,000 Unimats in use prove the inherent value of the multi-functional idea.) New MAXIMAT 10, a larger American Edelstaal multi-purpose machine is now earning world-wide acceptance. Unimat and Maximat are not the first machines in the world to combine multiple functions. There have been many lathes and milling machines with attachments. But such afterthoughts in design always meant a sacrifice in accuracy, setup convenience or in machine stability.

Maximat 10 is *not* a lathe with attachments. From the start, it was designed as a multi-functional frame massed to properly support both horizontal and

vertical spindles. Lathe and bed castings went through many stages of load testing under extreme conditions, resulting in dozens of design refinements. Spindles using the finest bearings were designed to handle the *three different kinds of load*; radial load in lathe turning, end thrust in boring and drilling, and side thrust in milling.

These are the reasons your Maximat will hold tight accuracies better than many single-purpose machines in all its operations. The extra quality built into the massive castings delivers *extra accuracy*, often far beyond other machines in the same price bracket.

Maximat is a favorite in design and development laboratories, medical research facilities, electronic and military applications...wherever special

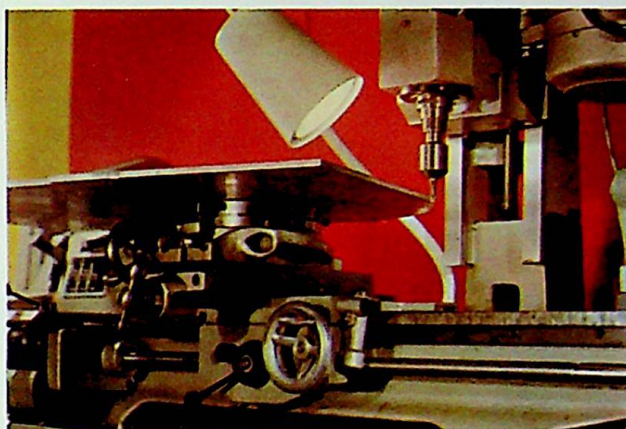
instruments and fixtures must be made quickly and accurately. Wherever space is precious, aboard subs, in mobile instrument repair trucks—Maximat is ideal because it fits anywhere doing the work of half a dozen separate machines.

With Maximat you can rapidly produce almost any shape in any material right in your own facility. But prototype work is only half the story, Maximat can be setup for profitable production work too.

Whether you are thinking of using Maximat 10 in a laboratory, plant or private shop, you'll find no other machine offers so many advantages with so much built-in precision and long life at so low an investment. The job illustrations in this booklet demonstrate these facts.



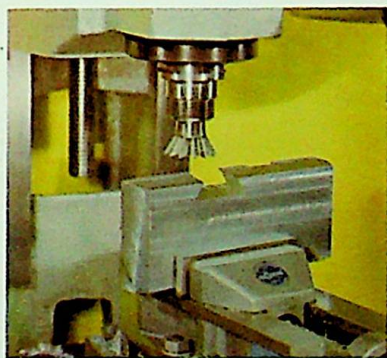
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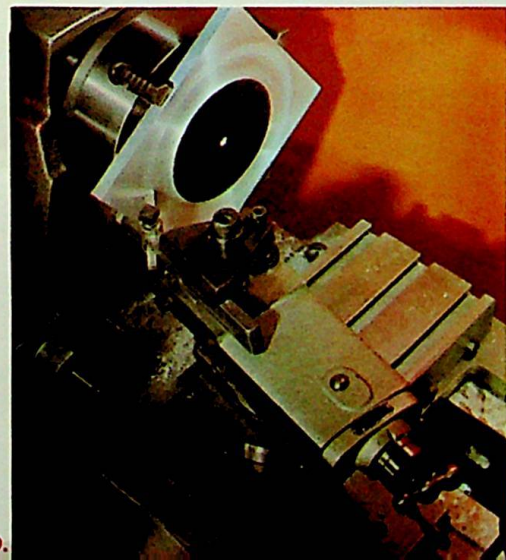
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1. Turning steel bar stock to diameter. Maximat handles up to 6x24 inch work pieces between centers; up to 65 pounds.

2. Precision threading of aircraft flange. Part is bored, then supported on mandrel between centers.

3. Steel stock in the design lab often must be reduced in thickness. Mounted in a collet, this cutter reduced a 1 inch aluminum bar to $\frac{7}{8}$ inch thickness in only 5 minutes...parallel and accurate within one-thousandth!

4. An unusual job in a physics laboratory. Turning spherical radii on an electrode. Concave shapes are turned in the same manner.

5. On larger size holes, this tool post grinder is used to size and finish the work to exact dimension. The grinder also takes jewelers' lathe collets for milling or drilling.

6. Round shapes larger than the 10 inch lathe capacity can be produced by milling. This 18 inch disc is mounted on a rotary table and fed to the cutter.

7. Here Maximat generates its own special fixtures. Two vise jaws are being milled with a $\frac{1}{2}$ inch end mill. Cut in tool steel was finished in about 15 minutes.

8. With a tilting vise, dovetails and slots for machine parts can be milled at any angle.

9. Turning a 6 inch square piece of $\frac{3}{4}$ inch thick aluminum. Work is held in a 4-jaw lathe chuck... finish, super smooth.

10. This experimental resonator required 6 precisely spaced holes on the cylinder. Easy on a Maximat, the job is simply clamped to the cross slide table...the hand feeds used to locate the work accurately beneath the drill point.

11. This precision panel is part of a military computer, the holes bored to an accuracy of 5 tenths—located in position to within one thousandth. The dial indicator mounted in the collet chuck is used to check a bore. Movement to the next position is obtained by feeding with the calibrated lead screw and cross slide controls.

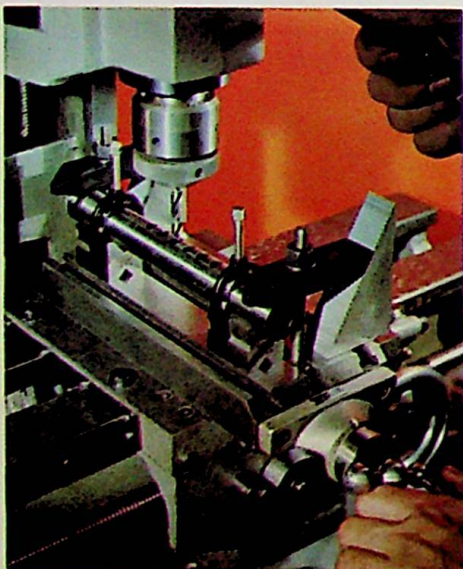
12. Angular machine parts are frequently needed in construction of special machinery. Workpiece is clamped to angle set table and milled. Slotting, or milling at compound angles can be done in the same way.

13. Slots in panels produced by an end mill. Maximat spindle speeds up to 3400 rpm are sufficient for clean fast cutting down to $\frac{1}{4}$ inch diameter. High speed milling heads and the Maximat tool post grinder can also be used vertically.

14. Here is how large holes are bored on Maximat. Workpiece is a 14-inch electronic panel, clamped to a $9\frac{1}{2}$ x 16 inch tooling plate which in turn is bolted to the cross slide. Boring tool adjusts to exact hole size by thousandths.

The 14 job illustrations that you see on these pages demonstrate the fact that Maximat offers you more capability than any machine in its price category. Accessories further enhance Maximat ability. Turn to the back of the booklet to see more complex set ups...just as fast and easy to accomplish in your own laboratory.

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MAXIMAT MODELS AVAILABLE

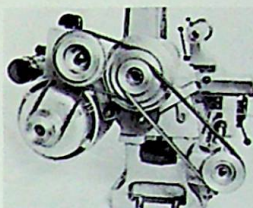
MODEL 4100 Dual Spindle Maximat, with Quick Change Gear Box

Lathe Headstock-Motor Unit* with reversing switch, Vertical Column, Vertical Headstock-Motor Unit* with reversing switch, Quick Change Gear Box, 7 inch Face Plate, Lathe Dog, 2 Dead Centers, Single Tool Holder, 4 'V' Drive Belts, Grease Gun, Set of Wrenches, Spare Hardware, High Quality Bearing Grease and Oil for Gear Box, Operating Instructions.

**Choice of any two motors listed below*

MODEL 4000 Dual Spindle Maximat, with Manual Change Gears

Identical to Model 4100 described above, except that in place of the Quick Change Gear Box which provides instant selection of threads and feeds, a quadrant and set of 12 change gears is provided. Also, in this model, the lead screw can be driven by the change gear train, or by a belt. The belt drive is used to obtain a very fine finish.



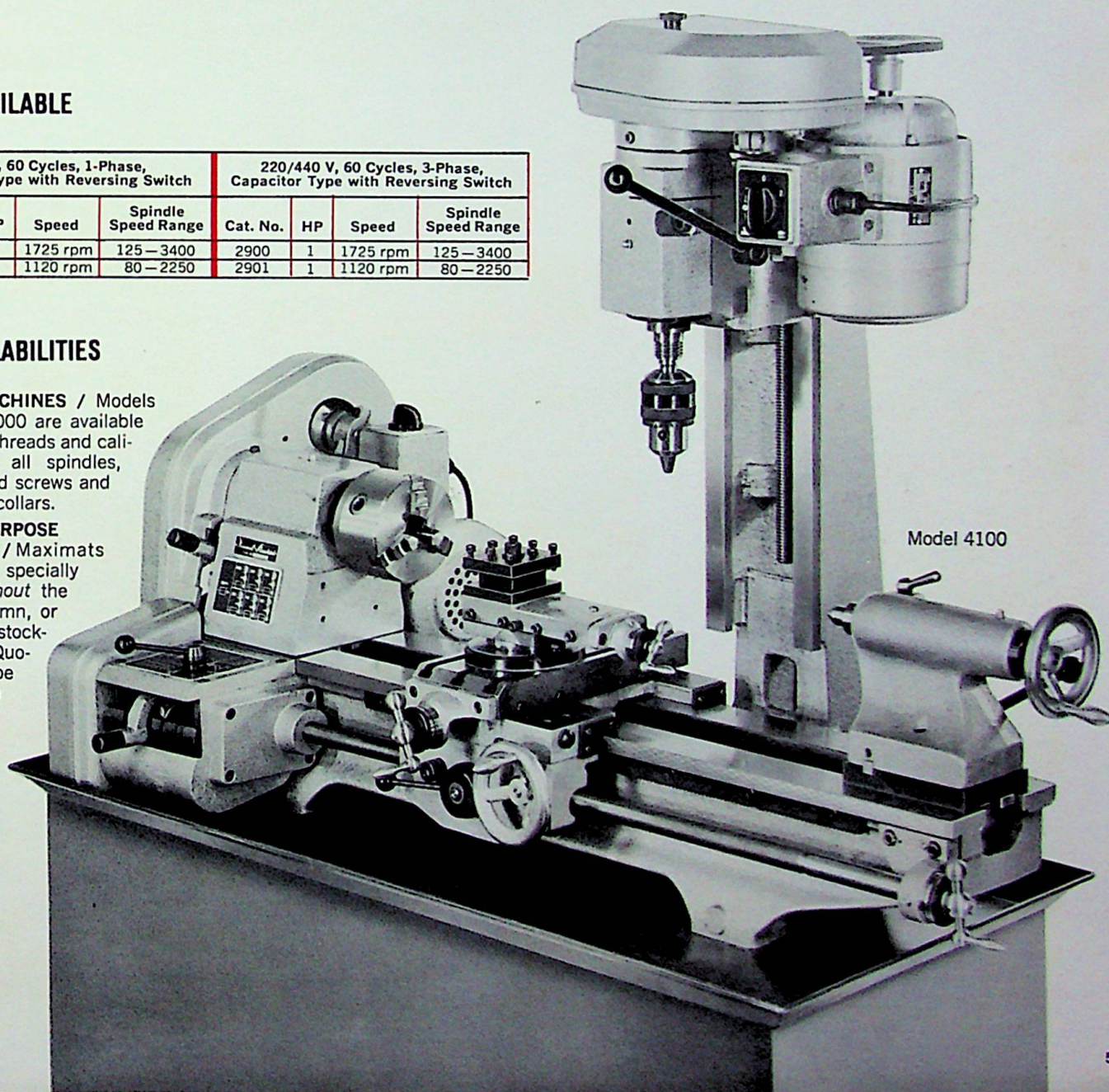
MOTORS AVAILABLE

115 V, 60 Cycles, 1-Phase, Capacitor Type with Reversing Switch				220/440 V, 60 Cycles, 3-Phase, Capacitor Type with Reversing Switch			
Cat. No.	HP	Speed	Spindle Speed Range	Cat. No.	HP	Speed	Spindle Speed Range
2910	1	1725 rpm	125—3400	2900	1	1725 rpm	125—3400
2912	1	1120 rpm	80—2250	2901	1	1120 rpm	80—2250

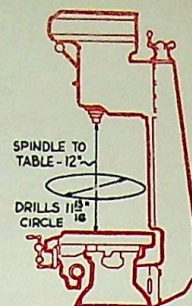
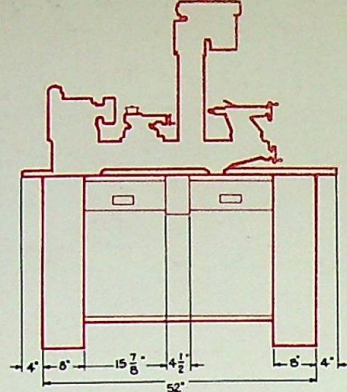
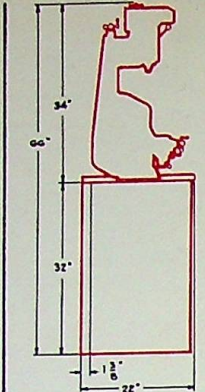
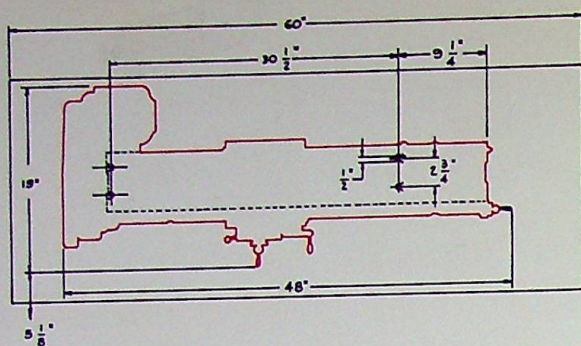
OTHER AVAILABILITIES

METRIC MACHINES / Models 4100 and 4000 are available with metric threads and calibrations on all spindles, lead and feed screws and micrometer collars.

SPECIAL PURPOSE MACHINES / Maximats can also be specially ordered *without* the vertical column, or vertical headstock-motor unit. Quotations will be furnished on request.



Model 4100



SPECIFICATIONS / MODELS 4000 & 4100

CAPACITIES

Horizontal

Swing over bed	10"
Swing over cross/slide	6 1/8"
Distance between centers	24"

Vertical

Vertebral spindle nose to cross slide	12"
Drill to center of circle	11 3/8"
Table, cross feed	6 1/4"
Table, longitudinal feed	19 3/4"

COMPONENTS

Lathe Headstock

Hole thru spindle	Takes 2 1/2"
Collet capacity	2 1/2"
Spindle nose	1 1/2" — 8 threads
Spindle taper	No. 3 Morse
Front spindle bearings	SKF Class 7 pre-loaded tapered roller bearings
Rear spindle bearings	SKF Class 7 pre-loaded angular contact ball bearings
	SKF Class 7 pre-loaded tapered roller bearings

Cross Slide/Milling Table and Compound

Table size	10"x 4 3/4"
Cross-slide table travel	6 1/4"
Cross-feed screw	1 1/2" dia. — 10 Acme tpi
Compound rest	Graduated 0-60° left and right
Compound rest travel on table	5"
Compound rest feed	3 3/4"
Compound feed screw	3/4" dia. — 20 tpi
Tool post capacity	3/4" or holder type oo

Vertebral Headstock

Hole thru spindle	Takes 3/4"
Collet capacity	3/4"
Spindle nose	1 1/4" — 12 threads
Spindle taper	No. 2 Morse
Front spindle bearings	SKF Class 7, double row pre-loaded tapered roller bearings
Rear spindle bearings	Two SKF Class 7, angular contact ball bearings
Spindle pulley bearings	Two SKF angular contact ball bearings
Spindle quill feed	1 1/4"

Tailstock

Spindle	1 1/2" dia.
Spindle taper	No. 2 Morse
Spindle travel	3 1/4"
Spindle feed screw	1/2" dia. — 10 Acme tpi
Graduations	0-3" by 1/8ths
Set-over	3/8"

Machine Weight

Model 4100	460 lbs.
Model 4000	435 lbs.

SPEEDS, FEEDS AND THREADS

SPINDLE SPEEDS

with 1120 rpm motor
with 1725 rpm motor

80, 140, 250, 420, 720, 1250, 2000*, 2250* rpm
125, 210, 370, 620, 1100, 1900, 3100* 3400* rpm

*Extra belt available permits driving headstock directly from motor, without idler pulley. Higher speeds obtained may be used for small diameter milling, collet turning and drilling. Infinite speed electronic drive is also available.

LATHE BED AND VERTABED LEADSCREW 3/4" dia., 8 Acme tpi

FEEDS

MODEL 4100

MODEL 4000

No. of turning feeds Range	24 .002" to .0139"/rev.	2 .0015" and .005"/rev.
No. of milling feeds Range (lathe motor 1120 rpm)	144 .0133 to 1.445 feet/min.	12 .01 to .52 feet/min.
(lathe motor 1725 rpm)	.0208 to 2.200 feet/min.	.0156 to .792 feet/min.
THREADS Inch:	8, 9, 9 1/2, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 26, 28, 32, 36, 38, 40, 44, 48, 52, 56 *All other inch threads with Universal Quadrant & Change Gears, Cat. No. 3120	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 26, 28, 30, 32, 36, 38, 40, 42, 44, 48, 52, 56, 60, 64, 72, 80, 84, 88, 96, 104, 112, 128
Metric:	With Universal Quadrant & Change Gears, Cat. No. 3120 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.60, 0.70, 0.75, 0.80, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50, 2.75, 3.00, 3.50, 4.00, 4.50	0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.60, 0.70, 0.75, 0.80, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50, 2.75, 3.00, 3.50, 4.00, 4.50

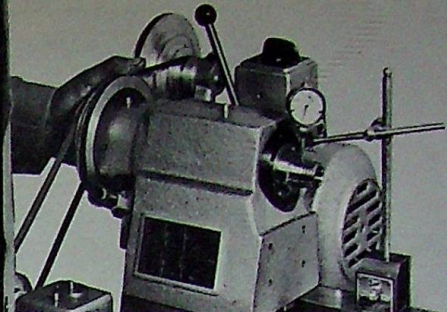
*NOTE: In addition to the more frequently used threads listed above, a virtually unlimited number of inch and metric threads can be cut using the quadrant and change gears furnished with standard Model 4000 or the Universal Quadrant and Change Gears available as an accessory for Quick Change Model 4100.

LIFT
HERE

TESTING & INSPECTING MAXIMAT¹⁰

During the manufacture of a Maximat, hundreds of critical examinations are made of parts, fits and assemblies and their operation—some of which are pictured here. Matching parts are banded together and inspected as unit pairs. As shown on the inspection sheet, final tests of Maximat accuracies must equal or surpass requirements more exacting than ASA standards for tool room precision lathes! In many cases, actual working accuracies of a Maximat will approach precision limits that are almost indetectable on highly sensitive tenth-of-a-thousandth dial gage used by inspectors. Graphic proof that Maximat is truly a lathe in the "instrument makers" class.

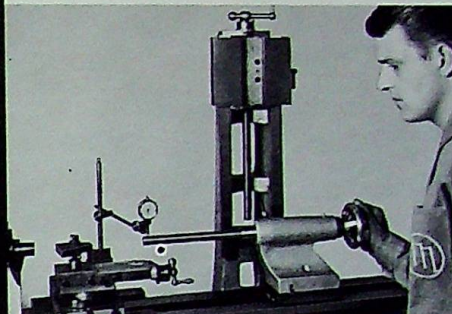
Similar tolerances apply to the Vertabed headstocks, making Maximat capable of vertical boring accuracies below 1/1000 inch tolerance.



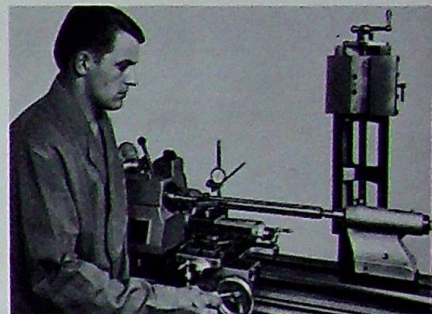
Checking cam action and runout of spindle.



Morse Taper test bar is used for reading both horizontal and vertical headstock alignment.



Reading tailstock vertical, horizontal and ram feed alignment.

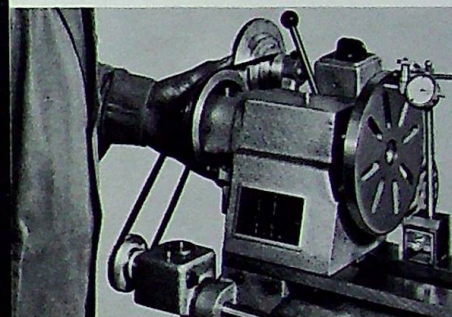


Horizontal alignment of head and tail centers checks with dial gage mounted on top surface of cross slide table.

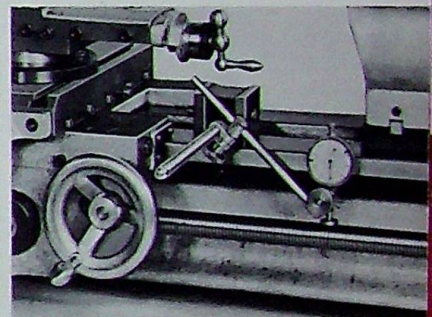
MAXIMAT TEST SHEET					
Machine No.		Inspector:	Limit	Actual	Explanation
No.	Test	Illustration			
1	Cam action of Spindle		.00039		Measured parallel to axis on spindle shoulder.
2	Spindle shaft runout		.00039		Measured at right angle to spindle shaft.
3	Spindle taper runout		.00039 .00079		Measured at points A and B. Test bar: MT2, 3/4"x8"
4	Headstock alignment vertical		.00079		Measured from slide. Test bar: MT2, 3/4"x8"
5	Headstock alignment horizontal		.00079		Measured from compound moved parallel to bed. Test bar: MT2, 3/4"x8"
6	Alignment of compound		.00118		Measured from slide. Test bar: MT2, 3/4"x8"
7	Tailstock taper alignment vertical		.00118		Measured from slide. Test bar: MT2, 3/4"x8"
8	Tailstock taper alignment horizontal		.00079		Measured from slide. High at end of spindle.
9	Tailstock spindle alignment vertical		.00039		Measured from slide. Forward at end of spindle
10	Tailstock spindle alignment horizontal		.00079		Measured from slide. Test bar: 1 1/4"x14"
11	Horizontal alignment of head and tail centers		.00079		Measured from slide. High at tailstock. Test bar: 1 1/4"x14"
12	Vertical alignment of head and tail centers		.00079		Faceplate turning. Cam action measured parallel to axis.
13	Precision in facing axial		.00079		Measurement of flatness from straightedge. Hollow or concave only.
14	Precision in facing flatness		.00039		Measured on both ends of 3/4"x3" work piece mounted in chuck.
15	Precision in turning cylindrical with work mounted in chuck		.00039		Workpiece 3/4"x3" measured at right angles.
16	Precision in turning round with work mounted in chuck				

Precision tolerances established by the Every machine

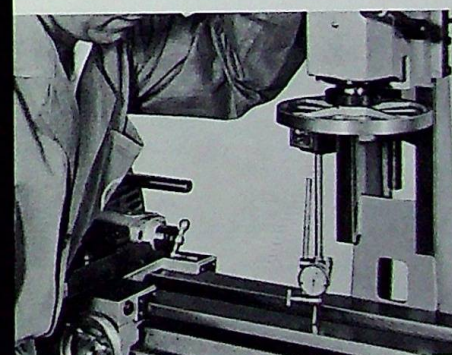
A photostat of a typical Maximat Inspection Department Test Sheet is shown. Figures in the limit column indicate gage readings which all Maximats must exceed before they leave the factory...highly sensitive dial gages that detect movement in the fractions of a tenth of a thousandth are used in these production tests.



Checking to the tenth-of-a-thousandth for face plate performance and axial facing.



One of a group of tests confirming lead screw alignment and runout; important factors in threading accuracy.



Dial gage clamped to test face plate confirms vertical spindle truth and squareness.

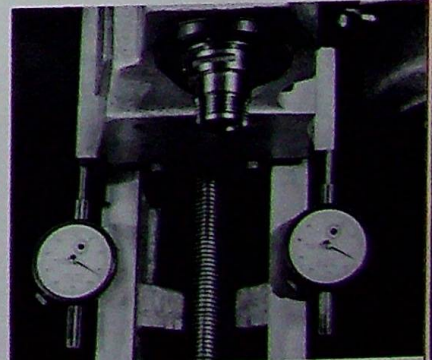


Large master square and feeler gage confirm dead-on perpendicular face of Vertabed in relation to cross slide.

STATEMENT OF ACCURACY

Precision tolerances on Maximat units consistently surpass those established by the American Standards Association for tool room accuracy. Every machine is tested and certified to conform to the following limits:

SPINDLE NOSE RUNOUT	.00039"
CAM ACTION OF HEADSTOCK SPINDLE	.00039"
SPINDLE TAPER RUNOUT measured at spindle	.00039"
SPINDLE TAPER RUNOUT measured at 8" from spindle	.00079"
FACE PLATE RUNOUT (at nominal diameter)	.00079"
HORIZONTAL ALIGNMENT of headstock and tailstock	.00079"
VERTICAL ALIGNMENT of head and tail centers	.00079"
HEADSTOCK ALIGNMENT, horizontal	.00079"
TAILSTOCK ALIGNMENT, horizontal	.00118"
TAILSTOCK TAPER ALIGNMENT, vertical	.00118"



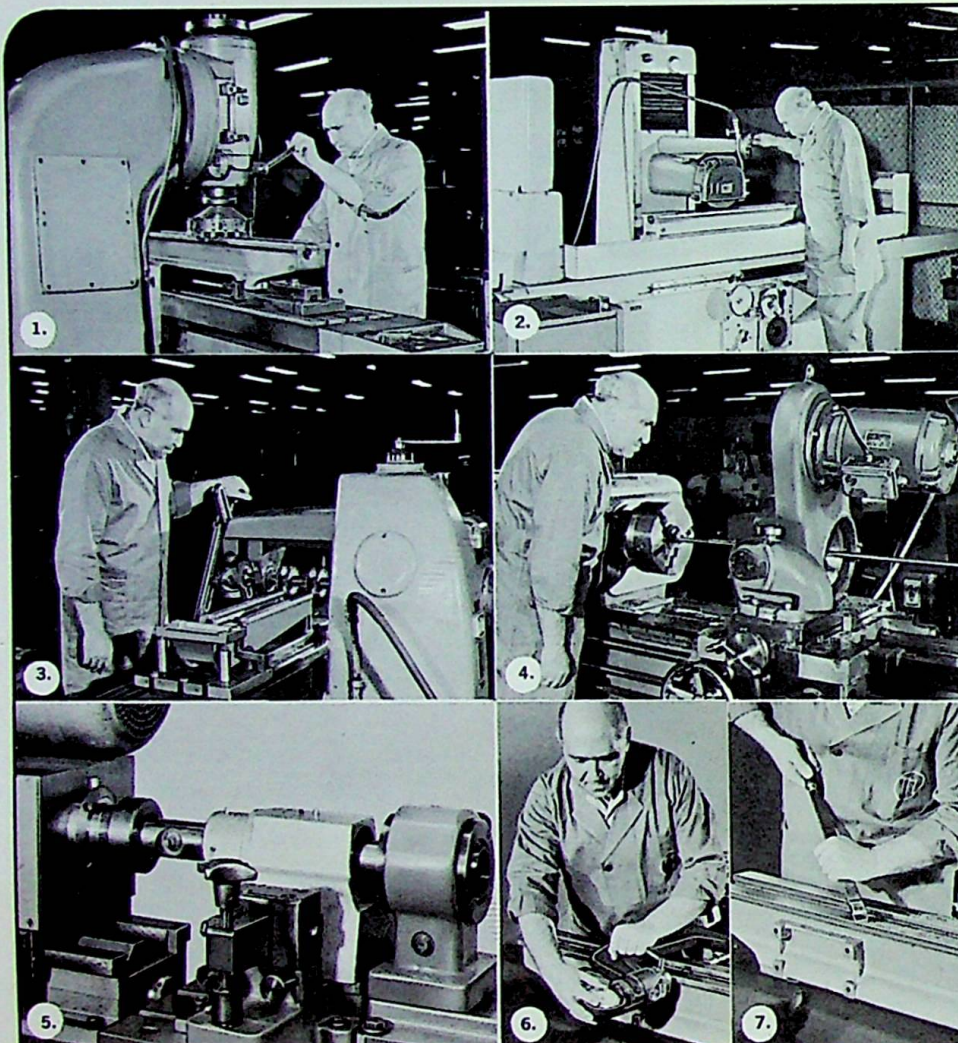
Paired dial gages confirm true vertical feed and tracking of head. Unlike many small vertical milling machine feeds, a properly adjusted Maximat head will show no drift or slewing action.

MAXIMAT¹⁰

HERE'S HOW MAXIMAT PRODUCES PRECISION AT A REASONABLE COST

A Modern Plant plus

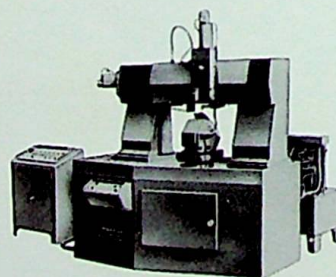
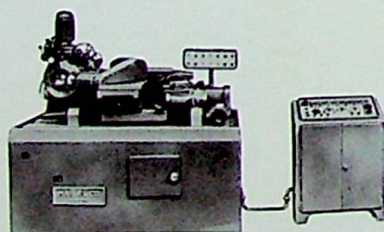
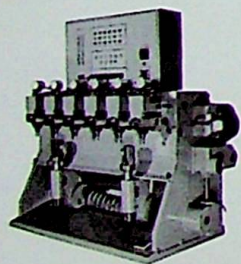
- Controlled metallurgy • Ultra-modern machine tools
- Hundreds of special jigs and fixtures for production and inspection • Highly skilled craftsmen



A complete section of our plant is devoted exclusively to Maximat production. In these photos, a superintendent demonstrates some of the key steps in producing Maximat precision.

1. Maximat lathe beds are cast of an unusually hard steel alloy that requires no flame hardening to hold its precision. Bed castings are aged about a year, then inspected for flaws. Here, one of our large vertical milling machines is face-milling the top surface of the lathe bed.
2. In the grinding room, a modern automatic surface grinder brings the bed down to near final flatness. Beds are ground on top, four sides, and underneath the ways.
3. Maximat Vertabed castings are brought to near-size on this special milling machine fixture which guarantees parallelism and size consistency. Like the lathe beds, Vertabeds also go through the grinding department.
4. This special fixture generates lead screw threads by the thread milling process. Maximat lead screws are also ground to insure final accuracy.
5. This machine was built to do just one job... boring Maximat headstocks and tailstocks. Later they are individually matched and paired.
6. In a white room, a technician uses another company product, a portable hardness gage to confirm the exceptionally dense and tough wear-resistant quality of Maximat lathe beds.
7. The slow and delicate process of hand scraping is used to bring the bed down to near optical flatness. A skilled man spends many hours checking and finishing one bed. Maximat beds are often used as measuring surfaces and optical benches.

The company is also world famous for many of its advanced instruments and special machines which include electronic hardness testers, grinders for chuck scrolls and jaws, wood working machinery, and a complete line of precision lathe chucks.



MAXIMAT HEADSTOCKS

25/32" Collet Capacity...superb bearings
...superb alignment



Cut-away of
Maximat 10 Lathe Head.

SIMILARITIES OF LATHE & MILLING HEADSTOCKS

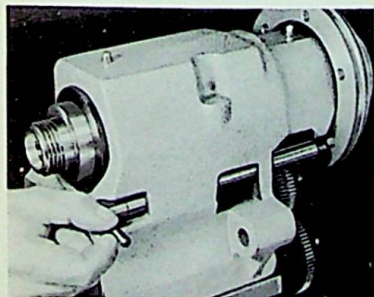
All Maximats come with two headstocks, identical in center distances, base mount details and motor supports. Actually, these headstocks are interchangeable. Both headstock spindles run in class 7 SKF bearings (see specifications, page 6) and are run-in at the factory. An extra feature is the lubrication system designed to provide effective lubrication to all vital bearings, giving your Maximat a trouble-free service life of many years.

DIFFERENCES IN THE TWO HEADSTOCKS? Your Maximat 10 lathe headstock has a No. 3 Morse Taper and takes a full $\frac{3}{4}$ inch bar through the bore. A variety of American and Swiss made collets can be used. The Vertabed head has a No. 2 Morse Taper bore, with a $\frac{3}{4}$ inch capacity. You can use the vertical head's No. 2 MT shank tools in the lathe headstock or tailstock by using a reducer sleeve that converts the No. 3 MT bore to a No. 2 with no loss of accuracy. This arrangement of taper systems was chosen because the Morse Taper system offers a wider variety of taper shank drills and milling cutters than any other.

LATHE HEADSTOCK. Easy removal and interchangeability of both headstocks makes it feasible for a skillful machinist to rig a raiser block for the lathe and increase swing, or to mount the Vertabed headstock backwards on the lathe bed facing the lathe spindle. This provides boring or face milling capability from both ends with the work piece mounted in the middle on the cross slide. This versatility of Maximat parts is useful in an emergency as many customers have found out.

VERTABED HEADSTOCK, utilizes independent pulley bearings so that the main spindle bearings are isolated from the one-sided pull of the motor drive. Your spindle floats free and accurate! Machines that lack this feature may transmit vibrations causing frame deflections or 'quivers' of the headstock.

The Vertabed spindle has a lever that provides less quill travel than found on most drill presses. This is because Maximat is set up as a *precision boring machine*. A quill can extend only so far outboard before it becomes wobbly and inaccurate. Using the Vertabed screw drive to feed downward, you can drive a long shank drill and hold good accuracy—a job you couldn't tackle with an ordinary drill press.



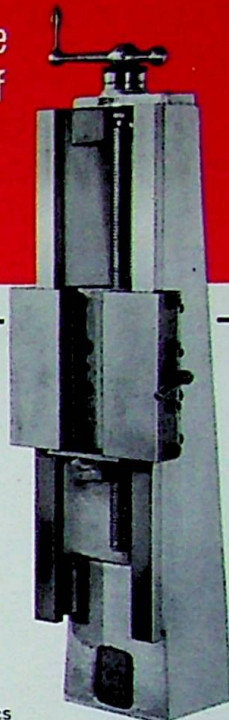
Lathe head is equipped with indexing pin useful in markup and lineup work. For finer indexing, the Maximat dividing head with plates and worm drive will split a circle into 70 different combinations or 360° with great accuracy. See accessory catalog.



Cut-away of
Maximat Vertabed Head.

VERTABED

...a machine
in itself

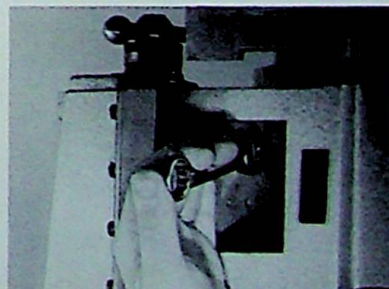


The Maximat 10 Vertabed is like another lathe bed. The casting is balanced and solid, weighing 60 pounds. Its vertical headstock feeds up and down by thousands on the dial, via a lathe quality ball bearing mounted lead screw. There is no slewing or side to side grabbing as it travels, and it can be driven by pulleys or motors if a measure of automation is required.

This headstock is designed for fast removal. Without it, the Vertabed remains one of the most useful devices you can find on any machine tool. The carriage surface is dead flat, on which a variety of fixtures or high speed drilling heads can be mounted. These are desirable for fine finish detail work in aluminum, plastics or wood, and for jobs such as printed circuit board routing and drilling.

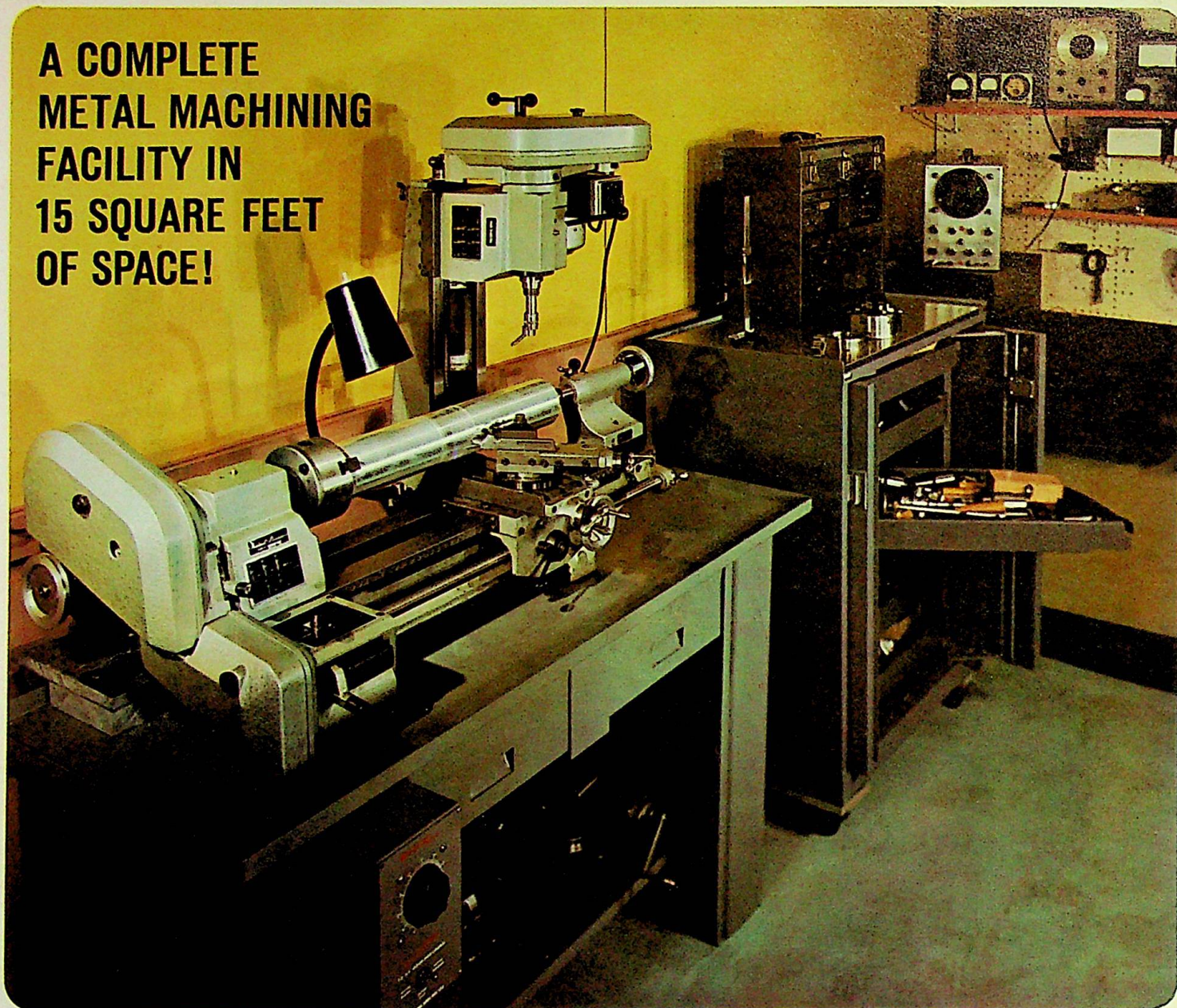
An exceptionally versatile Maximat accessory is the lathe tool post grinder. This 5,000 to 10,000 rpm grinding head has a jewelers lathe bore that takes standard WW type collets. It can be mounted on the Vertabed by means of a spacer block giving you the utility of either a miniature high speed routing head or a highly precise surface grinding fixture.

Here's a most unusual application of the Maximat and its Vertabed in the department of surgery, Cleveland Metropolitan General Hospital. A problem in medical research is the preparation of hard calcified bone specimens thin enough to be examined under a microscope. These specimens had to be cut evenly with surfaces parallel. Scientists mounted a motor driven diamond cutting wheel horizontally on the tool post grinder spindle. The wheel, turning at 6000 rpm, is water cooled and protected by plastic spray shields. The specimen is controlled by Maximat lathe bed and cross feed screws.



Loosening only 2 bolts, you can remove the Vertabed headstock easily in a few minutes.

**A COMPLETE
METAL MACHINING
FACILITY IN
15 SQUARE FEET
OF SPACE!**



Maximat 10 is the ideal answer for the creative product designer, electronic engineer, inventor or scientist.

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